

# Proposal: Dust Detection Network

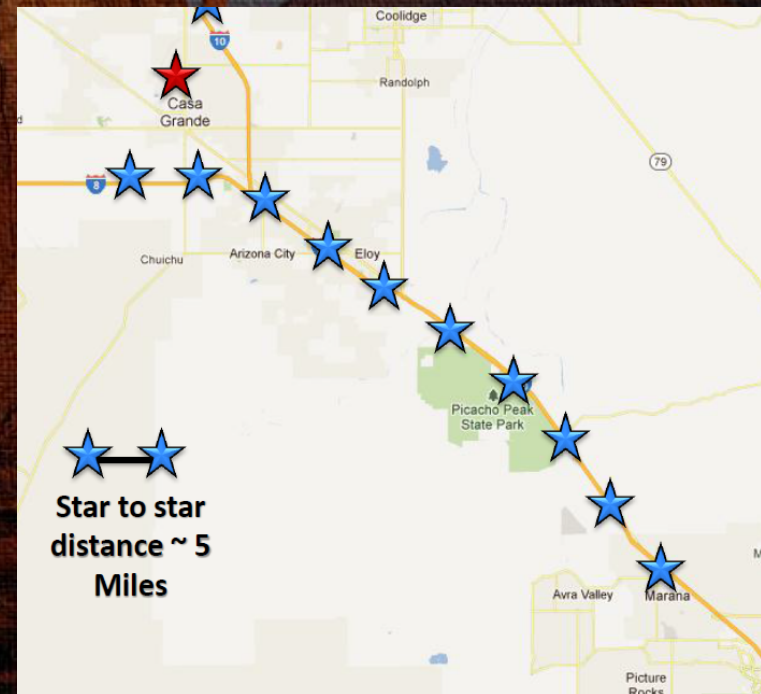
Ken Waters  
National Weather Service  
Phoenix



# Flashback: 2012 Workshop

## Ways To Improve?

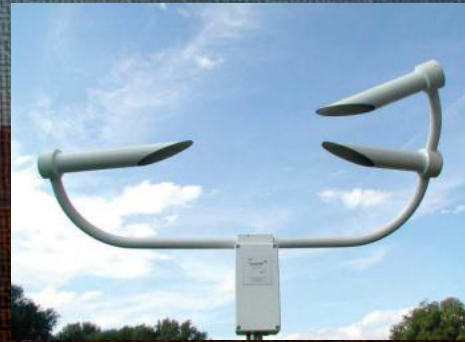
- Dust “Mesonet”
- Campbell Scientific Weather Stations
  - ~\$9,000 to \$16,000 per station
- Measures
  - Visibility
  - Dust
  - Soil Moisture
  - Plus web cam





# Need Low-Cost, Easy-to-maintain Solution


- High cost, typically due to visibility sensor



- Here's an alternative:
  - Instead of directly attempting to measure visibility with expensive proprietary sensors...
  - Why not use low-cost air quality sensors that are readily available and are proven at measuring PM10 and PM2.5 dust particulates?



# Need Low-Cost, Easy-to-maintain Solution



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**Optical Dust Sensor - GP2Y1010AUoF**  
COM-09689 RoHS✓

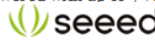
**Description:** Sharp's GP2Y1010AUoF is an optical air quality sensor, designed to sense dust particles. A infrared emitting diode and a photo transistor are diagonally positioned into this device to allow it to detect the scattered light in air. It is especially effective in detecting very fine particles like cigarette smoke, and is commonly used in air purifier systems.

The sensor has a very low current consumption (20mA max, 11mA typical), and can be powered with up to 7VDC. The output of the sensor is an analog signal with a measured dust density, with 0.5V/0.1mg/m<sup>3</sup>.

To interface with the sensor, you need a 1.5mm pitch connector; we designed this.



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 Open Hardware Facilitator

\$11.95

Backorder

1 quantity

Out of stock

\$11.95 price

\$10.76 10+ units


\$9.56 100+ units

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**Grove - Dust Sensor**



Price: \$15.50 (Price Feedback)

SEN12291P

Weight: 25Gram

Units in Stock: 41

Designed by: Others

Other products from designer

Quantity: 1 Max: 41

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# “3<sup>rd</sup> Industrial Revolution”

-- The *Economist*

- New Technologies Transforming Imagination into Working Technology using open-source low-cost platforms

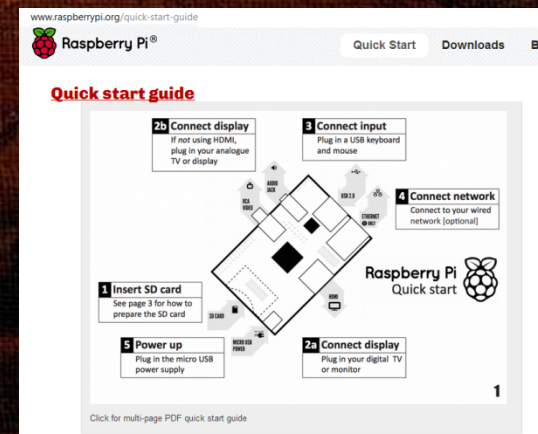
## Arduino

- (see TED video:
  - <http://geekboy.it/videos/how-arduino-is-open-sourcing-imagination>)
- Cost: \$30

## Raspberry Pi

- <http://www.raspberrypi.org/>
- Cost: \$35

## 3D Printing





# Implementation

- Inexpensive hardware
  - Total cost per station: \$100 (\$30 Arduino, \$15 sensor, \$30 communications shield, \$25 misc parts)
- Utilize spotter network volunteers
  - In particular volunteers located in typical problem areas such as I-10 corridor (e.g., Sacaton, Casa Grande, Eloy, Arizona City, Picacho)
- Use existing Internet router/modem to transmit observations automatically



# Next Steps

- Set up prototype station (s) to generate baseline observations of dust storm passages in order to develop appropriate alert levels
- Set up common web space to receive the regular observations

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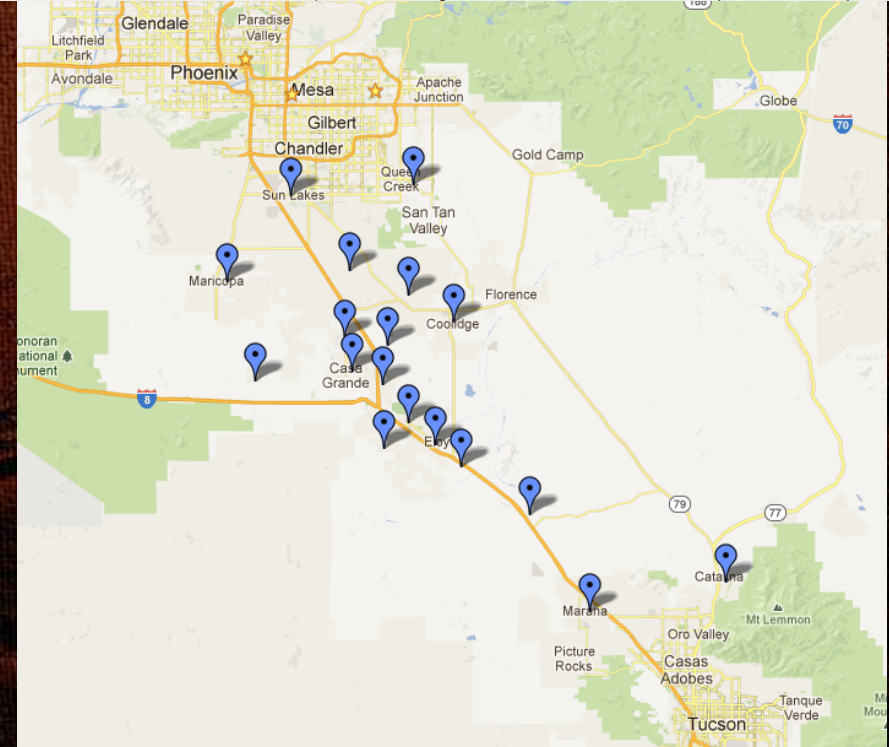
Where the Internet of Things is being built.

Connect devices and apps on the Cosm platform, exchange data and ideas with developers, and bring smart products to the world.



Nimbits is a service for connecting people, sensors and devices on the cloud. It is a free, social and open source platform for the [Internet of Things](#).

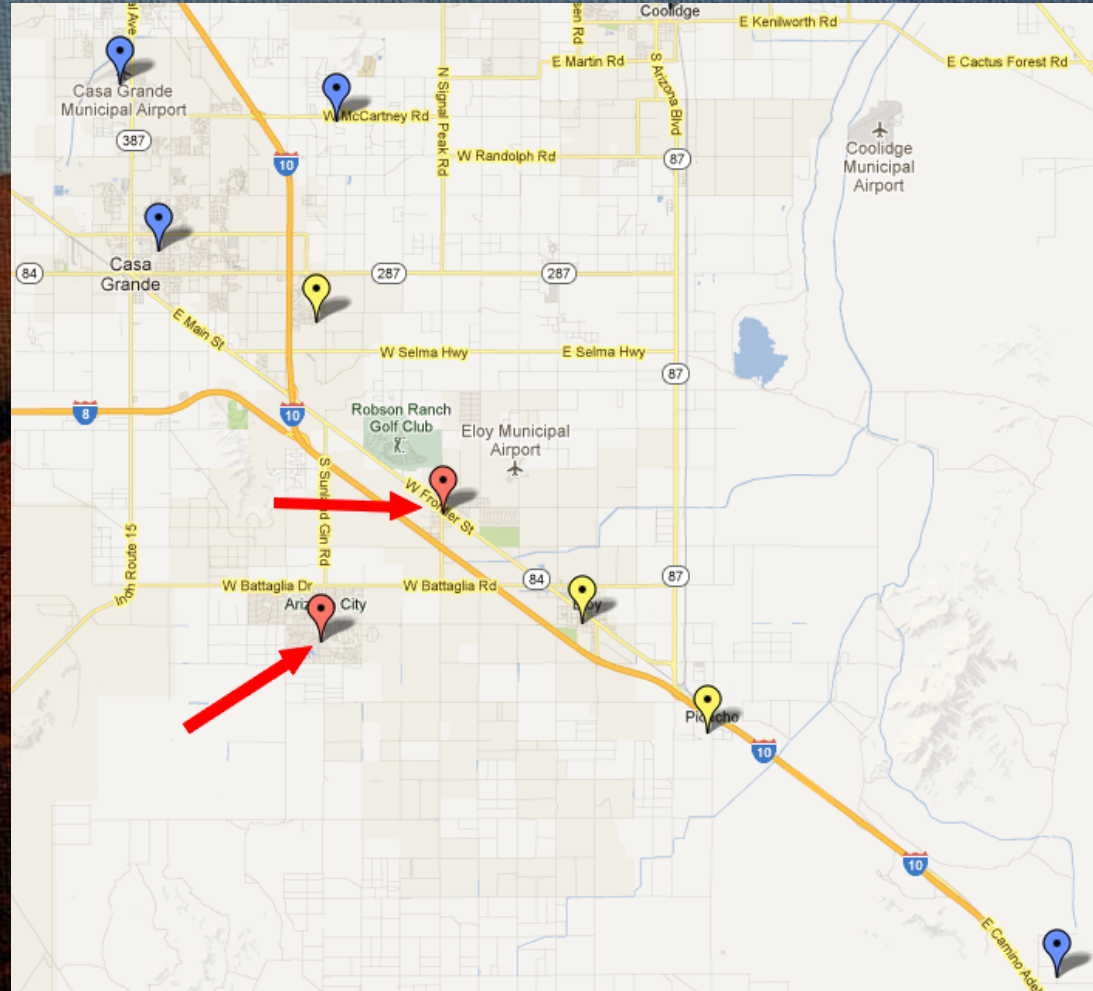
Login to Nimbits to create Data Points and record timestamped data into your points through our API and Web Portal. Your data can consist of numbers, objects, gps, xml, json or anything else. Incoming data can trigger email alerts, calculations, statistics, tweets and more. The Nimbits platform runs on Google's infrastructure with out of the box scalability and disaster recovery. You





# Benefits

- Inexpensive !!!
- Can alert NWS, ADOT, DPS, other agencies of existence of dust storms in real-time





# Questions?

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